THE STATUS AND DISTRIBUTION OF DRAGONFLIES OF THE MEDITERRANEAN BASIN

Compiled by Elisa Riservato, Jean-Pierre Boudot, Sonia Ferreira, Miloš Jović, Vincent J. Kalkman, Wolfgang Schneider, Boudjéma Samraoui and Annabelle Cuttelod

MEDITERRANEAN

The IUCN Red List of Threatened Species™ - Regional Assessment

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Published by IUCN (International Union for Conservation of Nature)

Published by:	IUCN, Gland, Switzerland and Malaga, Spain.
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Red List logo:	© 2008.
Citation:	Riservato, E. *et al*. (2009). *The Status and Distribution of Dragonflies of the Mediterranean Basin*. Gland, Switzerland and Malaga, Spain: IUCN. vii + 33 pp.
ISBN:	978-2-8317-1161-4
Cover design by:	Chadi Abi Faraj, IUCN Centre for Mediterranean Cooperation.
Cover photo:	Moorland hawker (*Aeshna juncea*) © Fabio Pupin.
Back cover photo:	Beautiful demoiselle (*Calopteryx virgo meridionalis*) © Jean Pierre Boudot.

Layout by:	Chadi Abi Faraj.
Produced by:	IUCN Centre for Mediterranean Cooperation.
Printed by:	Solprint, Mijas (Spain).
Available from:	IUCN Centre for Mediterranean Cooperation C/ Marie Curie 22 29590 Campanillas, Malaga, Spain. Tel: +34 952 028430 Fax: +34 952 028145 or IUCN Publications Services, www.iucn.org/publications A catalogue of IUCN publications is also available.

The text of this book is printed on 115 gsm environmentally-friendly paper.

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Acknowledgements

Assessing species for the IUCN Red List of Threatened Species relies on the willingness of scientists to contribute and pool their collective knowledge in order to produce the most reliable estimates regarding the status of species. Without their enthusiastic commitment to species conservation, this kind of regional overview would not be possible.

The coordination of the Mediterranean Red Lists is carried out by Annabelle Cuttelod from the IUCN Centre for Mediterranean Cooperation (IUCN-Med). We would like to express our particular gratitude to Sandra Simoes, Nieves Garcia and Dania Abdul Malak for their support in this project, in particular for organizing the training and evaluation workshops, their logistical, technical, and administrative help, as well as for reviewing this document and ensuring that the whole project ran smoothly. Training on the IUCN Red List Categories and Criteria, as well as the facilitation in the evaluation workshop and technical support, has been provided by the IUCN Species Programme, in particular David Allen, Will Darwall, Anna McIvor, Caroline Pollock, Kevin Smith and Helen Temple. Vineet Katariya and Susannah Ohanlon have provided the GIS maps and analysis for this publication. Jean-Christophe Vié, Jamie Skinner and Will Darwall have developed the different aspects of this project and promoted it constantly, and therefore we are very grateful to them. We received extensive expert advice and assistance from IUCN/SSC Dragonfly Specialist Group.

We would also take this opportunity to thank the IUCN Moroccan National Committee, in particular Brahim Haddane, for the logistics of the training workshop held in Rabat (Morrocco), as well as the Research Centre for Biodiversity and Genetic Resources of Porto University (CIBIO-UP) who provided the venue and logistics for the evaluation workshop, and the University of Porto and the municipality of Vila do Conde who supported it.

This work was funded by the European Union under grant contract: EuropeAid/ENV/2004-81917, the MAVA Foundation, and the Agencia Española de Cooperación Internacional para el Desarrollo (AECID) through the IUCN Centre for Mediterranean Cooperation. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the European Commission or the International Union for Conservation of Nature (IUCN).

Participants of the IUCN Freshwater Biodiversity Red List Evaluation Workshop, October 2007, Porto (Portugal). Photo: ©Abdelhamid Azeroual.

Executive Summary

Aim

This report contains a review of the conservation status of 165 Mediterranean species of dragonflies occurring in the Mediterranean basin, according to the IUCN regional Red Listing criteria. It identifies species that are threatened with extinction at regional level so that appropriate conservation action can be taken to improve their status.

Scope

The geographical scope of this report is the Mediterranean region in terms of freshwater hydrosystems, defined by identifying all catchments of rivers flowing into the Mediterranean Sea as well as in the adjacent Atlantic waters of Spain, Portugal and Morocco.

Status assessment

The status of all species was assessed using the IUCN Red List Criteria (IUCN 2001), which are the world's most widely accepted system for measuring extinction risk. All assessments followed the *Guidelines for Application of IUCN Red List Criteria at Regional Levels* (IUCN 2003). The assessments were peer-reviewed by other experts during a workshop and through correspondence with relevant experts.

Results

Almost a fifth (19%) of the dragonfly species occurring in the Mediterranean region are threatened and a further 16% are Near Threatened. Four species (2%), *Agriocnemis exilis**, *Ceriagrion glabrum*, *Rhyothemis semihyalina* and *Phyllomacromia africana* are listed as Regionally Extinct.

Threatened dragonflies are found all over the Mediterranean region. However, some areas have a particular high concentration of threatened species: the most notable are the southern Balkans, north-eastern Algeria and the Levant with the adjacent southern parts of Turkey.

Fourteen percent of the species in the Mediterranean Basin are endemic, (9 of these are threatened and 5 Near Threatened). This highlights the responsibility that the Mediterranean countries have to protect the global populations of these species. The highest number of endemics are found in the Maghreb and in the Levant whereas the smaller numbers are found in the southern Balkans, Crete and the Western Mediterranean.

Dragonfly diversity is greatest in the northern parts of the region as both Mediterranean and more boreal species can be found in the same area. Italy has the highest number of species due to its particular shape allowing the presence of North African species in the south and alpine species in the north. Other species rich areas are found in France, the Balkans region, Greece, Tunisia and Turkey. Habitat destruction, degradation, pollution and mismanagement of water bodies are significant threats to dragonflies in the Mediterranean Basin. In recent years it has become clear that Climate Change will turn out to be one of the most important threats to dragonflies in the Mediterranean. Increased water demand together with a lower level of precipitation will result in the desiccation of brooks, a habitat on which many of the endemics are dependent.

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* The species *Agriocnemis exilis* was recently recorded during the last IUCN African Dragonfly workshop (April 2009) and is in the process of being re-categorized.

Conclusions

- **Threatened dragonflies in the Mediterranean Basin require urgent action to improve their status**
  While some species are already receiving some conservation attention thanks to international laws (e.g. the European Habitat Directive), others are not. The priorities identified in this study include addressing the threats, such as the destruction and degradation of freshwater habitats, and the need to improve monitoring, surveys and studies in some important areas of the Mediterranean Basin.

- **Regional action is urgently needed**
  This report shows where the highest diversity, the highest level of endemism, and the highest portion of threatened dragonflies are found within the Mediterranean region. Based on this, five areas of high conservation concern were selected (Maghreb, The Levant, Crete, Southern Balkans and Western Mediterranean). These areas are discussed separately, and for each one, conservation actions are prioritized.

- **A sustained investment in the conservation and monitoring of species sites and landscapes is needed for all Mediterranean countries**
  To ensure that Mediterranean species are secure in the long term, this needs to be combined with the political will to integrate biodiversity conservation into all policy sectors.

The moorland hawker (*Aeshna juncea*) copulating (Least Concern). This is a widespread species, present in central and northern areas of Europe. In the Mediterranean area its range is restricted to higher altitudes and mountain areas. It is associated to all kinds of standing water at higher altitudes and latitudes. At present no threats are known for this species, but in the future global warming might represent a major threat, possibly leading to the loss of species at the limit of its range area (e.g., Portugal). Conservation of breeding habitats is required, especially in isolated areas of its range. Photo: © Jean-Pierre Boudot.

1. Background

1.1 An introduction to damselflies and dragonflies

Dragonflies are a well-known group of insects (Corbet 1999) and many people appreciate their striking colours and acrobatic flights. Their larvae live in freshwater environments and use both running and still waters. Many species have small distributional ranges, and are specific to certain habitats, ranging from alpine mountain bogs to desert wadis. In the temperate regions of the world, dragonflies feature prominently in nature management and often they are used as indicators of environmental health and conservation management. Their sensitivity to the quality of habitat (Moore 1997) (e.g. forest cover, water chemistry, rivers and bank structure), their amphibious habits, and the relative ease of their identification make dragonflies well suited for use in evaluating environmental changes in the long term (biogeography, climatology) and in the short term (biology conservation, water pollution, structural alteration of running and standing waters), although they are not as sensitive as many other benthic invertebrates, particularly those which are involved in determining the Biotic Indexes. There are several good identification keys and field guides available for the Mediterranean (Dijkstra and Lewington 2006, Dumont 1991, Jacquemin and Boudot 1999, Kalkman 2006). These enable mapping schemes to be conducted by volunteers, facilitating the use of distributional data on dragonflies in management.

Dragonflies can be recognized by their long and slender abdomen, their large globular eyes, which often make up a large portion of the head, their short antennae and their long wings. They are divided into two suborders,

The two suborders of Odonata, damselflies and dragonflies are easy to recognize. The first have the shape of the hindwing base similar to the forewing one, eyes widely separated by head and the wings at rest are usually held shut, the second have the shape of the hindwing base different and much wider than the forewing one, eyes envelop head and often touch each other and the wings at rest are spread out. Photo: © Fabio Pupin.

namely Zygoptera or damselflies, and Anisoptera or true dragonflies. In this report the word 'dragonflies' is used for both suborders.

Blue emperor (*Anax imperator*) emerging. Odonata larvae lives in water for even some years, and for this is needed to protect water bodies. Underwater, the larva changes skin a lot of time during its live, growing up. When the growing period is finished, the larva goes out from the water and moults for the last time. During emergence the individual change completely shape of the body, wings and the abdomen expand, and after the time needed to became sufficiently hard, fly away as an adult individual. Photo: © Elisa Riservato.

Dragonfly larvae prey on all kinds of small animals up to the size of tadpoles and small fish. Larvae take from a few weeks to several years to develop. Emergence takes place above the water on plants or on the shore, after which most species leave the water edge to mature. Males return to the water to search for females or to establish territories, and females often only return to mate and to lay their eggs.

With 5,680 species, dragonflies are a relatively small order of insects (Kalkman *et al*. 2008), and most of these species are found in the tropics. In the Mediterranean area (see Figure 2 for definition), 165 species are found, of which, 61 belong to the Zygoptera suborder and 104 to the Anisoptera suborder. In total 11 families are found in the region. The largest dragonfly families in the region are the Libellulidae (48 species), the Coenagrionidae (35 species), the Gomphidae (21 species) and the Aeshnidae (16 species). Almost one in seven of the dragonfly species found in the Mediterranean Basin is endemic to the region, but endemism is especially common among the Calopterygidae, Platycnemididae, Cordulegastridae and Coenagrionidae families (see Table 1 next page).

1.2 The Mediterranean

The Mediterranean Basin, stretching west to east from Portugal to the Levant, and north to south from northern Italy to the northern coast of Africa, is one of the world's richest places in terms of animal and plant diversity, and has a high level of endemism (Myers *et al*. 2000).

With almost 5,000 islands and islets, the Mediterranean comprises one of the largest groups of islands in the world. There are some 4,000 islands of less than 10 km^2 in the Mediterranean, and 162 with a surface area of 10 km^2 or more. The nine Mediterranean islands of over 1,000 km^2 account for 83% of the total island area. These islands are of high value to global biodiversity due to their wealth of species and relatively high levels of endemism.

Mediterranean rocky habitat in the Cres island, Croatia. Photo: © Fabio Pupin.

Table 1. Diversity and endemism of the dragonfly families of dragonflies in the Mediterranean Basin.

Order	Suborder	Family	Number of species (% of species)	Number of endemic species (% endemic)
Odonata	Zygoptera (damselflies)	Calopterygidae	7 (4%)	3 (43%)
		Epallagidae	1 (1%)	0 (0%)
		Lestidae	10 (6%)	1 (10%)
		Coenagrionidae	35 (21%)	8 (23%)
		Platycnemididae	8 (5%)	3 (38%)
		Sub-total of Zygoptera	61 (37%)	15 (25%)
	Anisoptera (dragonflies)	Aeshnidae	16 (10%)	1 (6%)
		Gomphidae	21 (13%)	3 (14%)
		Cordulegastridae	8 (5%)	3 (38%)
		Corduliidae	9 (5%)	1 (11%)
		Macromiidae	2 (1%)	0 (0%)
		Libellulidae	48 (29%)	0 (0%)
		Sub-total of Anisoptera	104 (63%)	8 (8%)
	Total		165 (100%)	23 (14%)

The region is characterized by its climate, where cool and wet winters alternate with long, hot, dry summers. Sometimes, for example in Libya and Egypt, annual rainfall is extremely low, but on the other hand, other countries are well-watered thanks to a high rainfall (including Algeria and part of the Balkans).

The countries bordering the Mediterranean have a total population of around 455 million people (Blue Plan 2008). The area has experienced intense human development and impact on its ecosystems for thousands of years, and various forms of human settlements have existed there for at least 8,000 years.

For many countries, water resources are a key issue, and in the southern Mediterranean countries, it is estimated that, Egypt, Israel, Libya, Malta, Syria and the Gaza Strip, for example, are using more than their renewable water resources (e.g. fossil water). About 64% of Mediterranean freshwater is used for agriculture (Blue Plan 2008).

In semi-arid areas, many years of unsustainable farming techniques have led to erosion, salinization and land degradation, and combined with the low rainfall, this has led to moderate risk of desertification that many areas in the Mediterranean are currently facing (Blue Plan 2008). Whereas previously, exploitation of the natural landscape was long, slow and relatively sustainable, in recent decades, the traditional balance between nature and humankind has been lost. The development of tourism has placed significant pressure on the region, mainly on the coastal ecosystems. The shores of the Mediterranean Sea are the biggest large-scale tourist attraction in the world, and 246 million people – 31% of all international tourists – visited the countries of the region in 2005 (Blue Plan 2008).

The construction of infrastructures and the direct human impact remains a key threat to coastal areas in Turkey, Cyprus, Tunisia, Morocco and Greece, as well as on the smaller Mediterranean islands.

Human demography and encroachment, the intensification of agriculture, fires, over-grazing, tourism and climate change are some of the major threats to Mediterranean habitats. Habitat fragmentation is also a serious problem and the original flora and fauna often is left in small, scattered patches.

Today, a mere five percent of the original extent of the hotspot contains vegetation that is relatively intact, placing the Mediterranean Basin amongst the four most significantly altered hotspots on the planet (Myers *et al*. 2000).

1.3 Mediterranean wetlands

For thousands of years, the wetlands around the Mediterranean Basin have provided essential services to local humans – water, food, materials, and transport – and have acted as a backdrop to their social and cultural activities. But in recent times, and especially during the first part of the twentieth century, Mediterranean wetlands have been destroyed or degraded in order to prevent water-borne diseases, to make room for the construction of housing and industry due to regularly increasing human populations, and to favour the development of tourism. Many have been systematically converted into agricultural landscapes to increase the local production. This has resulted in an estimated half of all Mediterranean wetlands being lost (EEA 2008), and of those that still remain, the major ecosystems are degraded, and nearly all important rivers in the Mediterranean Basin have been dammed (Smith and Darwall 2006).

The most widespread threats to freshwater habitats are drainage for agriculture and drinking water, settlements, urbanization and pollution. Mechanisms such as embanking a river, the over-exploitation of groundwater resources, or building dams, are just some of the many reasons why wetlands are deteriorating.

Wetlands are crucial for dragonflies, as they need the presence of water during both their terrestrial and aquatic phase. Water is the prime habitat for larvae, which can take years to develop and grow, and following this, adults will later need water for reproducing and often for food resources.

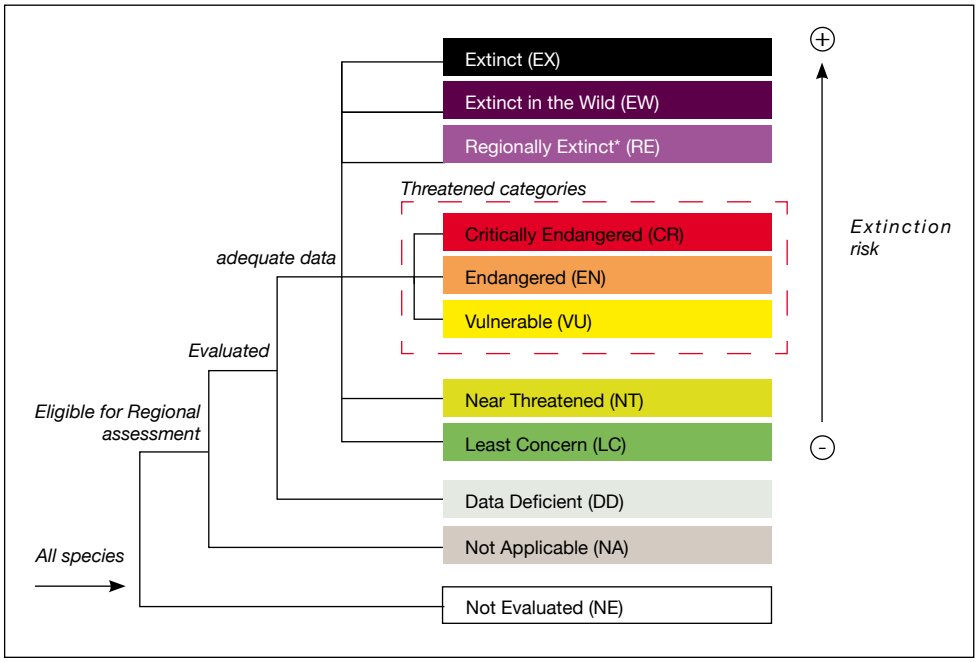
1.4 The IUCN Red List of Threatened Species

The conservation status of plants and animals is one of the most widely used indicators for assessing the condition and biodiversity of an ecosystem. It also provides an important tool in establishing plans for priorities to conserve species. The IUCN Red List Categories and Criteria are the world's most widely used system for gauging the extinction risk faced by species. This system is based on nine Categories (Figure 1), ranging from Least Concern, for species that are not threatened, to the Extinct category, for species that have disappeared from the planet (IUCN 2001).

These Categories are based on a set of quantitative criteria linked to population trends, population size and structure, and geographic range. Species classified as Vulnerable, Endangered and Critically Endangered are considered as 'threatened'. When conducting regional or national assessments, two additional categories are used (Regionally Extinct and Not Applicable) for non-native species (IUCN 2004).

Lake Tonga in Algeria. Photo: © Boudjéma Samraoui.

Figure 1. IUCN Red List Categories and Criteria at regional scale.



IUCN has already assessed the conservation status of 629 (11%) of the world's dragonflies species (IUCN 2008). Globally, 22% of the assessed dragonfly species are included in one of the threatened categories, and two species are Extinct (*Megalagrion jugorum* and *Sympetrum dilatatum*). However, IUCN is still in the early stages of assessing all 5,680 of the known dragonfly species. The assessment of all species in the Mediterranean region is a contribution to the overall aim of assessing the status of all dragonflies in the world.

1.5 Assessment objectives

This dragonfly assessment in the Mediterranean Basin has four main objectives:

- To give an overview of the conservation status of all dragonfly species present in the Mediterranean in order to facilitate conservation planning in the area.
- To identify the geographic areas and habitats that need to be conserved in order to prevent extinction.
- To highlight the major threats to Mediterranean dragonflies and propose conservation measures to mitigate their impact.
- To develop a network of regional experts to support future assessments and help update the information on these species within the context of the IUCN Global Dragonfly Assessment.

It also provides two main direct outputs:

- A printed report focusing on the status and distribution of dragonflies in the Mediterranean Basin, as well as their main threats, and also providing a spatial representation of the centres of diversity. Recommendations for conservation measures will be given in order to reduce the impact of the identified threats.

The data presented in this report is based on the knowledge available at the time of the writing, but as new information becomes available, the assessments may be updated.

2. Assessment methodology

2.1 Definition of the Mediterranean Basin for the assessment

The Mediterranean region, in terms of freshwater systems, was defined by identifying all catchments of rivers flowing into the Mediterranean Sea and the adjacent Atlantic waters in Spain, Portugal, and the Atlantic coast of Morocco, using GIS and the HYDRO1k Elevation Derivative Database (USGS EROS).

The assessment covers all drainages flowing into the Mediterranean Sea (Lower Nile only), in addition to the whole Iberian peninsula (except northern coastal drainages), the Marmara Sea drainages, the Tuz Golu in Turkey, the Dead Sea basin and River Jordan, the Moroccan drainages (both coastal and east flowing from the Atlas mountains), and the Chott Djerid and Melghir in Tunisia and Algeria respectively (Figure 2).

2.2 Regional and global assessments

The extinction risk of a species can be assessed at global, regional or national level. One species can have a different category in the Global Red List and a Regional Red List. For example, a species that is common worldwide and classed as Least Concern (LC) in the Global Red List could face a high level of threat and fit the Endangered category (EN) in a particular region (see Figure 1 for the explanation of the IUCN categories). In order to avoid an over- or underestimation of the regional extinction risk of a species, the Guidelines for the application of IUCN Red List Criteria at Regional Level should be applied (IUCN 2004). Logically, an endemic species should have the same category at regional and global level, as it is not present in any other part of the world.

2.3 Training workshop and preliminary assessments

A training workshop on the IUCN Red List Categories and Criteria and their application at regional level was organized in Rabat (Morocco) in February 2007 by the IUCN Centre for Mediterranean Cooperation in collaboration with the IUCN Species Programme.

During the workshop a list of species was defined, and the 165 species to be assessed were divided amongst the Mediterranean members of the Dragonfly Specialist

Figure 2. Mediterranean Basin as defined for this project.

Group of the IUCN Species Survival Commission (SSC). Preliminary conservation status assessments were conducted for all species using existing literature and data sources, in addition to personal knowledge. The data collected, including information on distribution, conservation measures, threats, habitats and ecology, was then entered into an MS-Access database via the IUCN Species Information Service Data Entry Module (SIS DEM).

Red List training workshop in Rabat (Morocco, February 2007). Photo: © Annabelle Cuttelod.

2.4 Review Workshop

The Mediterranean members of the Dragonfly Specialist Group were invited to attend a five-day regional review workshop at CIBIO in Porto (Portugal) in October 2007. All participants received the preliminary assessments (SIS DEM species summary reports) before the workshop and were asked to check the data and ensure that they included the most up-to-date, comprehensive and rigorous information.

Dragonflies review workshop in Porto (Portugal, October 2007). Photo: © Annabelle Cuttelod.

A workshop session was dedicated to discussing the most appropriate conservation measures, in order to reduce the impact of the dragonfly's main threats which were identified during the Red Listing process.

2.5 Post-workshop editing

Following the review workshop, the data was edited, and consistency in the use of IUCN Criteria was checked by the workshop participants and IUCN staff.

The resulting assessments, supported by relevant literature and references, provide the best available scientific consensus concerning the status of the species. Regular updates will be made when new information becomes available.

2.6 Database and distribution atlas of Mediterranean dragonflies

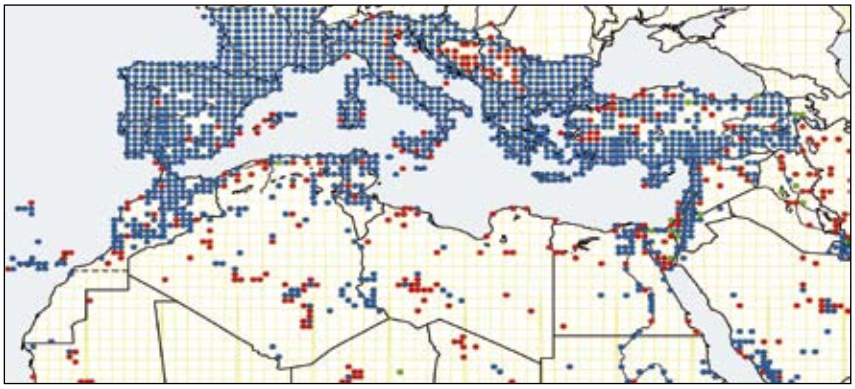
During the workshop held in Porto in October 2007, the participants decided to start working on an atlas of the Mediterranean and North Africa, which was published in March 2009 as *Supplement 9* of the journal *Libellula* (Boudot *et al*. 2009).

This atlas combines several different databases covering a total of 35 countries (15 European). It shows the distribution of 179 species and some additional subspecies that are present in the Mediterranean countries in the area between 18°N and 47°N, from the Canary Islands to W Iran (Figure 3); an area that significantly exceeds the Mediterranean region defined in the present report.

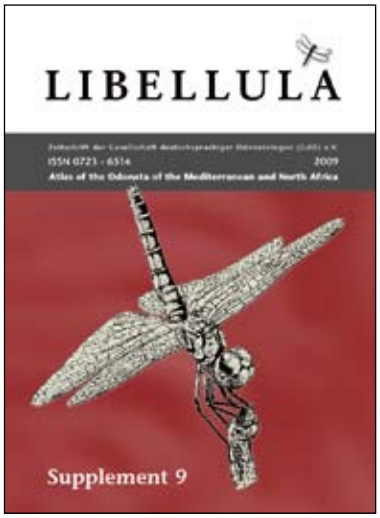
This database was also used to create some of the maps presented here. The atlas itself gives important background information for conservation by showing the former and current distribution of all taxa.

The different databases will be maintained and expanded in the future. In the atlas, information can be found on the focal point of each of the different databases used; these are the people who should be contacted by those wanting to contribute to the databases or use them for analyses or conservation works. For those wanting information on the database in general, they should contact the Chair of the IUCN Dragonfly Specialist Group.

Figure 3. Overview of all the countries and data localities included in the atlas of the Mediterranean and North Africa and cover of the publication (Boudot *et al.* 2009).



Red dots = records prior to 1980
blue dots = records from 1980 onwards
green dots = undated records.
If records for both periods are available for a grid, the more recent records have priority.



The banded demoiselle (*Calopteryx splendens*) is a common polytypic species throughout rivers of the Northern countries of the Mediterranean region (except on the Iberian Peninsula). Although it is classified Least Concern in the Mediterranean, it decreases locally through the destruction of its habitat and that affects populations across its whole range. This species is under some taxonomic debate, and therefore threats in certain areas of its range may be more serious as they may affect subspecies with restricted range. The picture shows *C. s. intermedia*, a subspecies confined to small parts of the Eastern Mediterranean which may become Near Threatened in the near future. Photo: ©Jean-Pierre Boudot

3. Results and discussion

3.1 Conservation status

A list of the dragonfly species present in the Mediterranean Basin, along with their IUCN Red List status, is available in Appendix 1. Of the 165 Mediterranean dragonflies species, 19% are classed as threatened: 3% are Critically Endangered, 8% are Endangered, and 8% are Vulnerable (Table 2; Figure 4). A total of 58% are classified as Least Concern, while 16% are Near Threatened. Four species (2%), *Agriocnemis exilis*, *Ceriagrion glabrum*, *Rhyothemis semihyalina* and *Phyllomacromia africana* are listed as Regionally Extinct. One species, *Pantala flavescens*, has been assessed as Not Applicable, as it is a circumtropical obligate migrant which goes north with the monsoons and shows only a very marginal occurrence and incidental reproduction in the Mediterranean.

Table 2. Summary of the Red List status of the dragonflies in the Mediterranean Basin.

IUCN Red List Categories	No. of species	No. of endemic species
Regionally Extinct (RE)	4*	0
Critically Endangered (CR)	5	0
Endangered (EN)	13	5
Vulnerable (VU)	13	4
Near Threatened (NT)	27	5
Least Concern (LC)	96	8
Data Deficient (DD)	6	1
Not Applicable (NA)	1	0
Total	165	23

* The Regionally Extinct species *Agriocnemis sania* was recently found in Egypt during the IUCN African Dragonfly workshop.

Conservation status varies between dragonfly families and some appear to be more vulnerable than others. For example, in the Calopterygidae family, three species out of seven are classed as threatened (43%); in the Coenagrionidae family, out of 35 species, six are threatened (17%), a further two are Regionally Extinct (6%) and six are Near Threatened (17%); in the Gomphidae family, six species out of 21 are threatened (29%); in the Cordulegastridae family, of the eight species, three are threatened (38%) and four are Near Threatened (49%); and in the Macromiidae family, comprised of two species, one is Regionally Extinct and the other is Vulnerable.

With respect to the endemic species, the results are not encouraging (Table 2, Figure 5). In fact, of the 23 species endemic to the Mediterranean Basin, nine are either Vulnerable or Endangered, and only eight are of Least Concern. Furthermore, several species are only marginally present in the Mediterranean Basin.

There is also another situation occurring amongst the northern and central European species, the alpine species, such as *Somatochlora alpestris*, *S. arctica*, *Aeshna caerulea*, *Aeshna subarctica elisabethae*, *Nehalennia speciosa*, *Sympecma paedisca,* and the various *Leucorrhinia* species. In this instance, although most of these species are classified as Least Concern on a global scale, their Mediterranean populations are sometimes under threat, due to their marginal and sometimes relict distribution in the region, and because of the fact that they are very sensitive to global warming and the desiccation of breeding habitats.

The oasis bluetail (Ischnura fountaineae) is a Least Concern species found in arid areas of the Mediterranean basin. Photo: © Jean-Pierre Boudot.

Figure 4. Summary of the conservation status of all dragonflies in the Mediterranean.

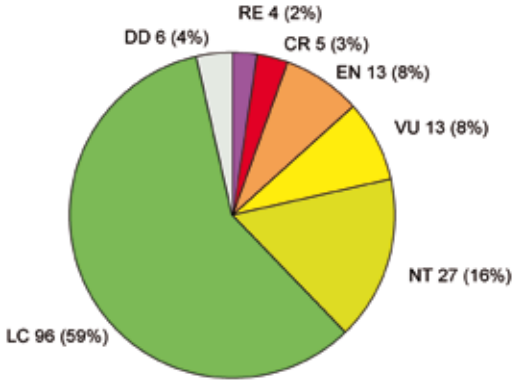
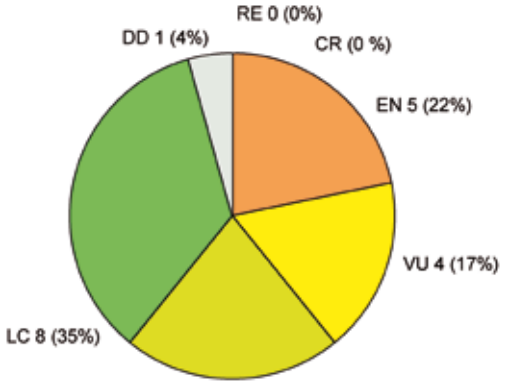


Figure 5. Summary of the conservation status of the endemic dragonflies in the Mediterranean.



Categories are abbreviated as: RE – Regionally Extinct; CR – Critically Endangered; EN – Endangered; VU – Vulnerable, NT - Near Threatened, LC - Least Concern, DD - Data Deficient and NA - Not Applicable.

Regionally Extinct species

Four species, all with a largely Afrotropical distribution, are Regionally Extinct in the Mediterranean. *Agriocnemis exilis*, *Ceriagrion glabrum* and *Phyllomacromia africana* have not been recorded since the beginning of the 1900s. These species were only known to be found in the Mediterranean in the now largely urbanized, cultivated and polluted Nile delta and Cairo area. The Afrotropical *Rhyothemis semihyalina* was first and last seen in Algeria in the mid-nineteenth century and disappeared from the Levant during the middle of the twentieth century due to the draining of the former Lake Hula in Israel.

The last Mediterranean record of Common pond damsel (*Ceriagrion glabrum*) was made in Egypt in 1928. The species is thought to be Regionally Extinct due to the urbanization of the Cairo area. Socotra, Yemen. Photo: © Elisa Riservato.

Threatened species

In the Mediterranean Basin, 31 species (19% of the total) are threatened (either Critically Endangered, Endangered or Vulnerable). Ten of these are endemic to the region and their situation gives extra reason for concern (see chapter 3.2.2.). Of the 31 threatened species, 22 are confined to running waters, while the others predominantly occur in still waters. All ten of the endemic threatened species are dependent on running waters. The threatened running water species are present throughout the region. The species that are dependant on standing waters, for the most part, fall into two groups: some of these are widespread Afrotropical species, which are rare in North Africa and threatened due to degradation of the freshwater marshes and lakes where they survived the aridification of the Saharan and Sahelian belts during the second half of the Holocene (*Agriocnemis sania, Urothemis edwardsii, Acisoma panorpoides ascalaphoides, Nesciothemis farinosa*); and others are mainly species with a central European or Boreo-Alpine distribution (*Nehalennia speciosa, Sympecma paedisca, Leucorrhinia albifrons, Aeshna caerulea, Sympetrum depressiusculum*). These species have experienced a strong decline due to habitat destruction, and are now further threatened

Table 3. Odonata species extinct at the Mediterranean Basin level

Family	Genus	Species	Common name	Red List status
COENAGRIONIDAE	*Agriocnemis*	*exilis*	Little whisp	RE
COENAGRIONIDAE	*Ceriagrion*	*glabrum*	Common pond damsel	RE
MACROMIIDAE	*Phyllomacromia*	*picta*	Darting cruiser	RE
LIBELLULIDAE	*Rhyothemis*	*semihyalina*	Phantom flutterer	RE

Table 4. The Odonata threatened species at the Mediterranean Basin level.

Family	Genus	Species	Common Name	Red List status	Endemic to the Mediterranean (Y/N)?
COENAGRIONIDAE	*Agriocnemis*	*sania*	-	CR	N
PLATYCNEMIDIDAE	*Mesocnemis*	*robusta*	-	CR	N
COENAGRIONIDAE	*Nehalennia*	*speciosa*	Sedgling	CR	N
LIBELLULIDAE	*Sympetrum*	*haritonovi*	Dwarf darter	CR	N
LIBELLULIDAE	*Urothemis*	*edwardsii*	Blue basker	CR	N
LIBELLULIDAE	*Acisoma*	*panorpoides*	Grizzled pintail	EN	N
CALOPTERYGIDAE	*Calopteryx*	*exul*	Glittering demoiselle	EN	Y
CALOPTERYGIDAE	*Calopteryx*	*hyalina*	Clear-winged demoiselle	EN	Y
CALOPTERYGIDAE	*Calopteryx*	*syriaca*	Syrian demoiselle	EN	Y
CORDULEGASTRIDAE	*Cordulegaster*	*helladica*	Greek goldenring	EN	Y
GOMPHIDAE	*Gomphus*	*graslinii*	Pronged clubtail	EN	N
LIBELLULIDAE	*Leucorrhinia*	*albifrons*	Dark whiteface	EN	N
LIBELLULIDAE	*Nesciothemis*	*farinosa*	Black-tailed false-skimmer	EN	N
GOMPHIDAE	*Onychogomphus*	*assimilis*	Dark princertail	EN	N
COENAGRIONIDAE	*Pseudagrion*	*niloticum*	-	EN	N
COENAGRIONIDAE	*Pseudagrion*	*nubicum*	-	EN	N
COENAGRIONIDAE	*Pyrrhosoma*	*elisabethae*	Greek red damsel	EN	Y
LESTIDAE	*Sympecma*	*paedisca*	Siberian winter damsel	EN	N
AESHNIDAE	*Aeshna*	*caerulea*	Azure Hawker	VU	N
AESHNIDAE	*Boyeria*	*cretensis*	Cretan spectre	VU	Y
LIBELLULIDAE	*Brachythemis*	*fuscopalliata*	Dark-winged-groundling	VU	N
COENAGRIONIDAE	*Ceriagrion*	*georgifreyi*	Turkish red damsel	VU	Y
CORDULEGASTRIDAE	*Cordulegaster*	*heros*	Balkan goldenring	VU	Y
CORDULEGASTRIDAE	*Cordulegaster*	*picta*	Turkish goldenring	VU	N
GOMPHIDAE	*Gomphus*	*lucasii*	Algerian clubtail	VU	Y
GOMPHIDAE	*Gomphus*	*ubadschii*	Syrian clubtail	VU	N
MACROMIIDAE	*Macromia*	*splendens*	Shining macromia dragonfly	VU	N
GOMPHIDAE	*Onychogomphus*	*flexuosus*	Waved princetail	VU	N
GOMPHIDAE	*Onychogomphus*	*macrodon*	Levant princetail	VU	N
CORDULIIDAE	*Somatochlora*	*borisi*	Bulgarian emerald	VU	Y
LIBELLULIDAE	*Sympetrum*	*depressiusculum*	Spotted darter	VU	N

The Spotted Darter (*Sympetrum depressiusculum*) used to be common in rice fields in the Mediterranean, but the intensification of agricultural practices has resulted in a strong decline of this species (Vulnerable). Camargue, France. Photo: © Jean–Pierre Boudot.

by climate change, as their habitats, such as fens and bogs, are being threatened by desiccation. The decline of *Sympetrum depressiusculum* is largely due to changes in the management of fishing waters and rice fields.

Near Threatened species

In the Mediterranean Basin, 27 species (16% of the total assessed) are classified as Near Threatened. These species are not yet considered to be threatened, but generally show a decline and could fit the criteria for a threatened category in the near future.

The ornate bluet (*Coenagrion ornatum*) is Near Threatened species threatened by habitat destruction. Potentially increased drought and drying out of habitats as a result of climate change is a future threat for this species that is included in the European Habitats Directive. Photo: ©Jean-Pierre Boudot.

Data Deficient species

Six species (4% of the total assessed) could not be assessed due to a lack of information regarding their past or current distribution, and are therefore categorized as Data Deficient. Only one of these species is found in Europe. Distribution of *Epitheca bimaculata* is, in the Mediterranean area, limited to Slovenia, Croatia, France, and in the past, North Italy. The species has a short flight period and an inconspicuous behaviour for which it is easily overlooked. Field investigations in Italy and Croatia need to be carried out when this species is emerging in order to reassess its present status within the Mediterranean. *Lestes numidicus* is the only Data Deficient species endemic to the Mediterranean, where it is currently only known to be found in Algeria. This is a recently described taxon and there is a lack of information about its possible distribution in other parts of the Mediterranean. The other four species all have a very limited range in the Mediterranean. Three of them have their main range in Asia (*Ischnura intermedia*, *Paragomphus lineatus*, *Sympetrum vulgatum decoloratum*) and a marginal occurrence in the eastern Mediterranean (mainly Turkey). Fieldwork focusing on the distribution and habitat of these species is needed. The fourth species, *Orthetrum abbotti,* is widespread in tropical Africa and is known from two Mediterranean records (1941, 2008), both showing it is confined to a small area on the fringes of the Dead Sea. Although the species here is probably a relict of a past post-glacial pluvial period, further investigations should be carried out to find out more about its true distribution in the Levant and Arabia.

Least Concern species

In the Mediterranean Basin, 96 species (58% of the total assessed) are not considered to be threatened at present or in the foreseeable future. They include mainly widespread species, but some of them may have only a small distribution area in the Mediterranean. Two of these, *Oxygastra curtisii* and *Ophiogomphus cecilia*, are included in the European Union Habitat Directive (92/43/EEC); the former given that its range is restricted to South-western Europe. At present, these species are better known and appear to be fairly common in the main part of its range (*Oxygastra curtisii*), or do not show a decline (*Ophiogomphus cecilia)*.

Many of the Least Concern species are abundant and widespread, but will benefit from habitat conservation management actions as threatened species do.

The banded darter (*Sympetrum pedemontanum*). This species is present across all the northern part of Italy to Slovenia, the south eastern part of France and the Southern Balkans. Some isolated populations are known from the northern part of Spain and the western part of France. It favours standing water, such as shallow pools with developed vegetation and slow-flowing waters, such a ditches and irrigation channels, with developed vegetation. Habitat destruction is the main threat to the species and potentially increased drought and drying out of habitats as a result of climate change is a future threat. Most species of this genus are easy targets for predatory fish species and can be impacted by aquaculture, but there are no specific data on the overall effects of this (Least Concern). Photo: © Fabio Pupin

Not Applicable species

Pantala flavescens is the only species of dragonfly that has been judged as Not Applicable. This species has a circumtropical distribution and is an obligate migrant, going north with the monsoon fronts and scarcely reaching the Mediterranean, yet it has once been reported to reproduce successfully in the region (Arlt 1999).

3.2 Patterns of species richness

3.2.1 Species richness

Information on the species richness of dragonflies is given in Section 1 and Table 1. The geographic distribution of dragonfly species richness in the Mediterranean Basin is presented in Figure 6.

On a global scale, the diversity of dragonflies can be largely explained by temperature and precipitation, with the highest diversity being found in the wet and hot tropics. In the Mediterranean, diversity largely coincides with precipitation patterns: areas with a relatively high rainfall, like the Alps and the mountains of the Balkans, Turkey, and the Maghreb, have a high diversity, whereas in regions with little rainfall, and hence relatively little freshwater, especially the Saharan belt, fewer species are found. Higher diversity in mountainous areas is of course not only influenced by rainfall, but also by the fact that there is a greater diversity of habitats in these areas.

Paleoclimatic events have also influenced the diversity of dragonflies. Past glacial times have strongly decreased species richness in parts of Europe and Asia and only a relatively small number of species were able to colonize these areas during the Holocene.

Table 3 shows the species richness in dragonflies of the countries of the Mediterranean Basin. As expected, higher totals of species are found in the countries of the central area of the basin. Italy has the highest number of species due to its particular shape, allowing the presence of North African species in the south, and alpine species in the north.

3.2.2 Distribution of endemic species richness

A relatively high percentage (14%) of Mediterranean dragonflies is endemic to the region. The highest numbers of endemic species are found in the Maghreb and the

Figure 6. Species richness of dragonflies in the Mediterranean Basin

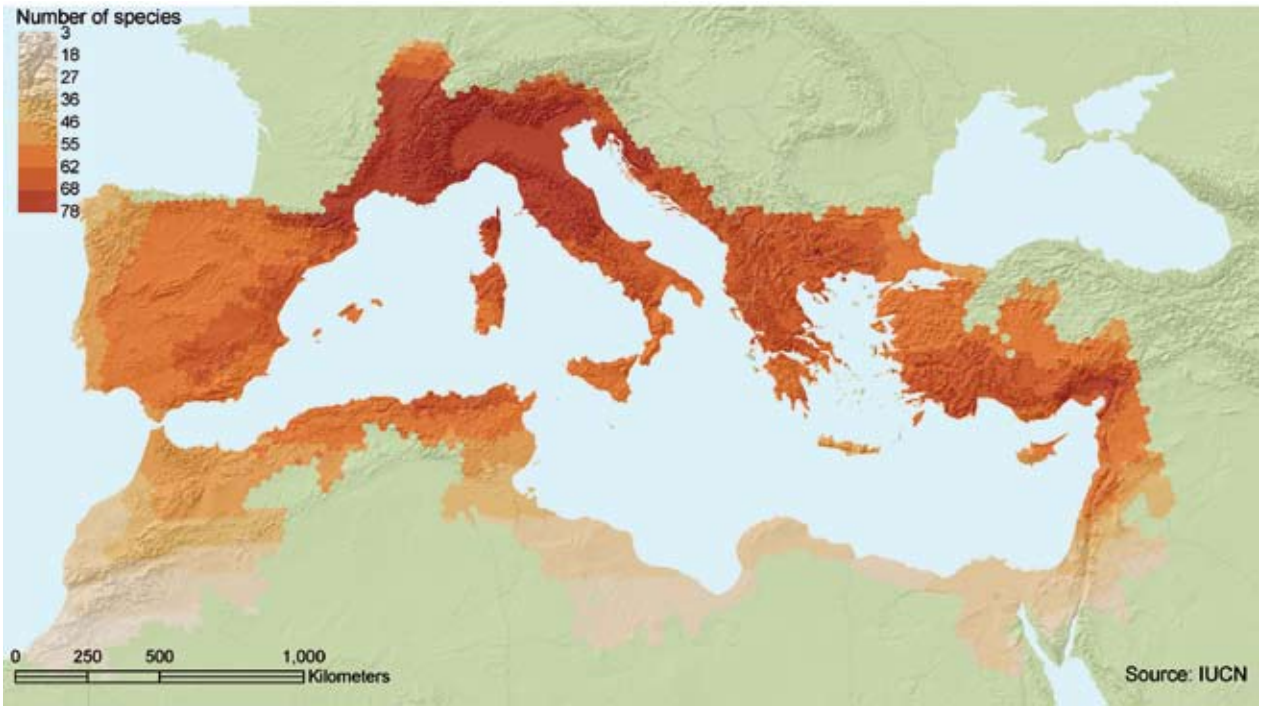
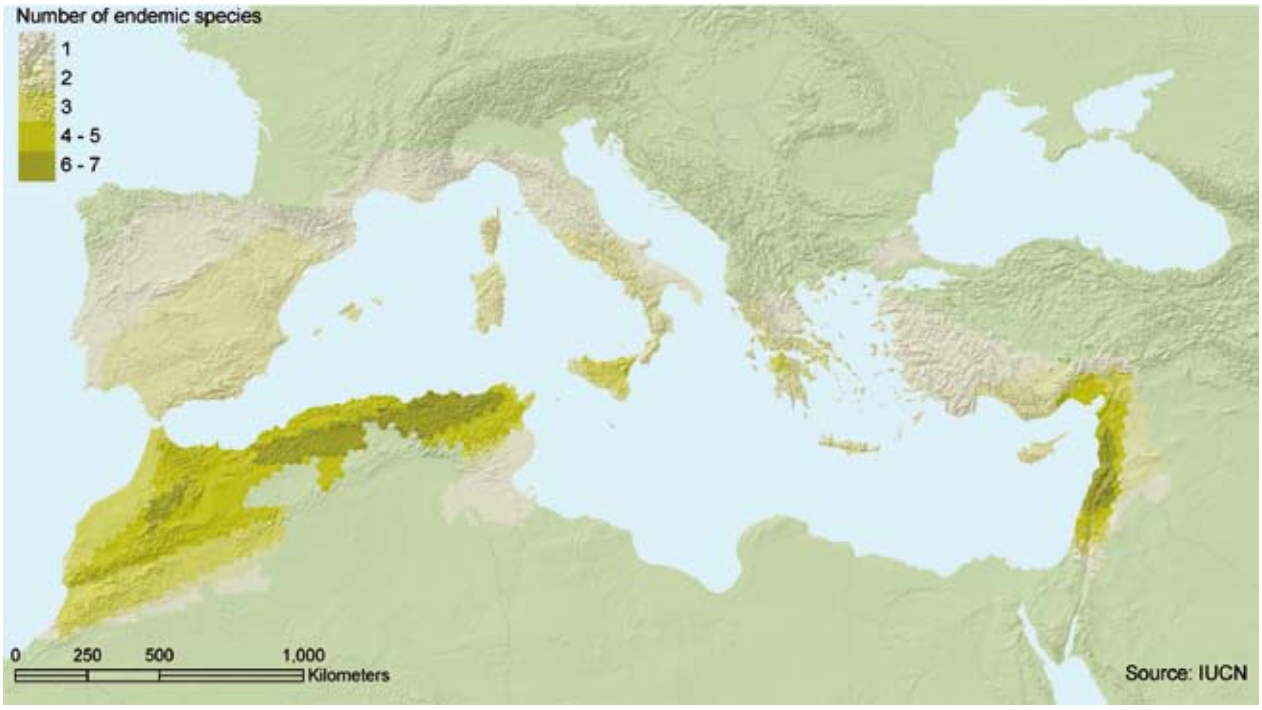


Figure 7. Species richness of endemic dragonflies in the Mediterranean Basin



Levant, whereas the lowest numbers corresponds to the southern Balkans, Crete and the Western Mediterranean (Figure 7).

Endemic species of the Maghreb: *Gomphus lucasii* (VU), *Calopteryx exul* (EN), *Cordulegaster princeps* (NT), *Lestes numidicus* (DD), *Enallagma deserti* (LC) and *Platycnemis subdilatata* (LC). Most of them are present in the running waters of the lower reaches of the mountains.

Levantine endemic species: *Coenagrion georgifreyi* (VU), *Onychogomphus macrodon* (VU), *Calopteryx hyalina* (EN), *Calopteryx syriaca* (EN), *Coenagrion syriacum* (NT), *Pseudagrion syriacum* (LC), *Gomphus davidi* (LC) and *Platycnemis kervillei* (LC). These

are mainly present in Lebanon, Israel, Jordan, the Palestinian Territories and the western parts of Syria. Many of them occur as far north as the Turkish Adana area (Ceyhan and Seyhan delta), while a few are present along the Turkish coast, mainly towards the west.

Southern Balkan endemic species: *Pyrrhosoma elisabethae* (EN), *Cordulegaster helladica* (EN) and *Somatochlora borisi* (VU). These are mainly present in Greece. The last-mentioned species is confined to irregular and partly shaded rivers in the northeast of Greece, the southeast of Bulgaria and European Turkey. *Cordulegaster helladica* occurs in small brooks in the Peloponnese up to the northern side of Corinth Gulf, Euboea, and in some Cyclades Islands (under several subspecies), while *P. elisabethae* ranges from the Peloponnese to Corfu and southern Albania.

Cretan endemic species: *Boyeria cretensis* (VU) and *Coenagrion intermedium* (NT). Both are scattered over the island of Crete, where they are more or less confined to the upper course of some rivers which remain unaltered and shaded.

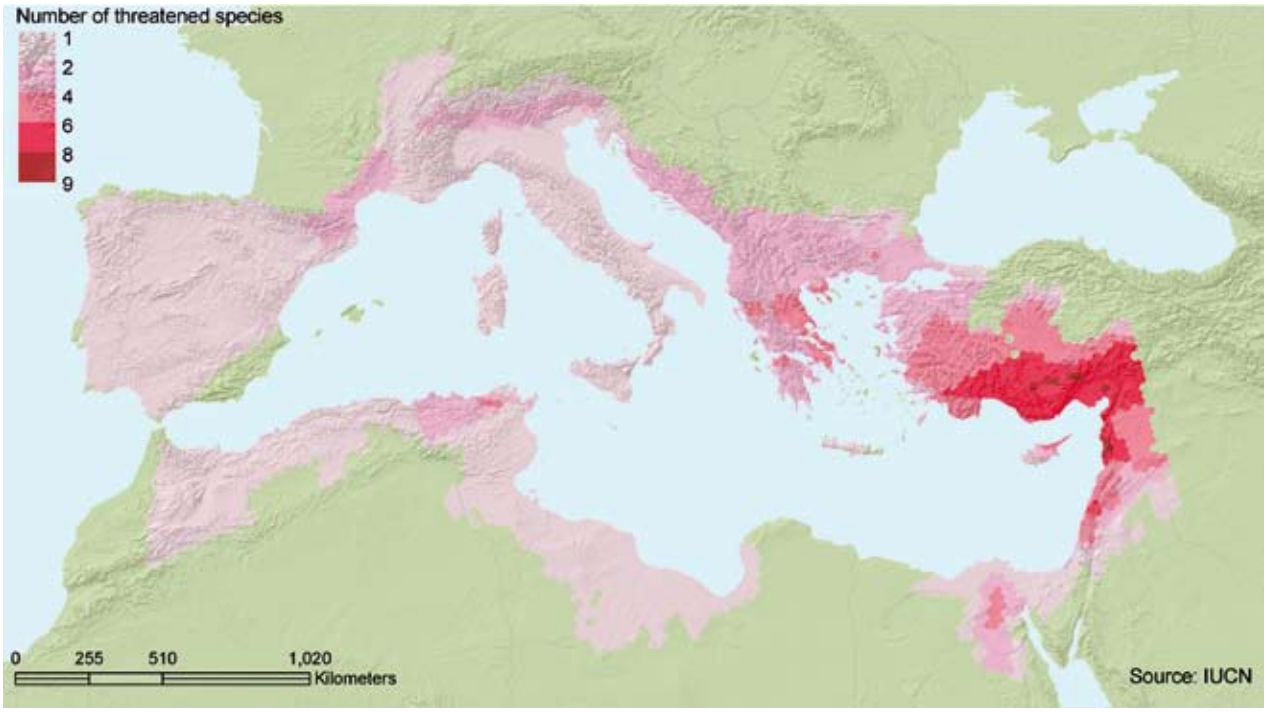
Western Mediterranean endemic species: *Onychogomphus costae* (NT), *Coenagrion caerulescens* (LC), *Ischnura genei* (LC) and *Cordulegaster trinacriae* (NT).

The Bulgarian Emerald (*Somatochlora borisi*) is confined to a small number of brooks and small rivers in the southeast of Bulgaria, the northeast of Greece and European Turkey (Vulnerable). Photo: © Jean–Pierre Boudot.

3.2.3 Distribution of threatened species richness

Threatened dragonflies are found all over the Mediterranean region. There are however a few areas with high concentrations of threatened species (see Figure 8). The most notable are the Levant and southern Turkey, the southern Balkans, northeastern Algeria (Numidia) and the adjacent northern parts of Tunisia.

Figure 8. Species richness of threatened dragonflies in the Mediterranean Basin



3.3 Major threats

Figure 9 shows a summary of the major threats to dragonflies in the Mediterranean region, as well as the number of threatened (31) and non-threatened (134) species.

Habitat loss and degradation caused by humans is the main threat for both threatened and non-threatened species, and is currently affecting 110 dragonfly species, including 30 of the 31 threatened species . Water pollution is also a major concern as it is having an impact on 97 species, of which 30 of them are threatened. Natural disasters like, for example, the disappearance of breeding habitats due to drought, have the next biggest impact, affecting 75 species, of which 26 are being threatened.

Global warming is likely to exacerbate the impact and extent of several of these threats and is one of the biggest present and future threats to dragonflies. The alpine and Mediterranean species now confined to man-made sub-desert areas are the most sensitive to global change.

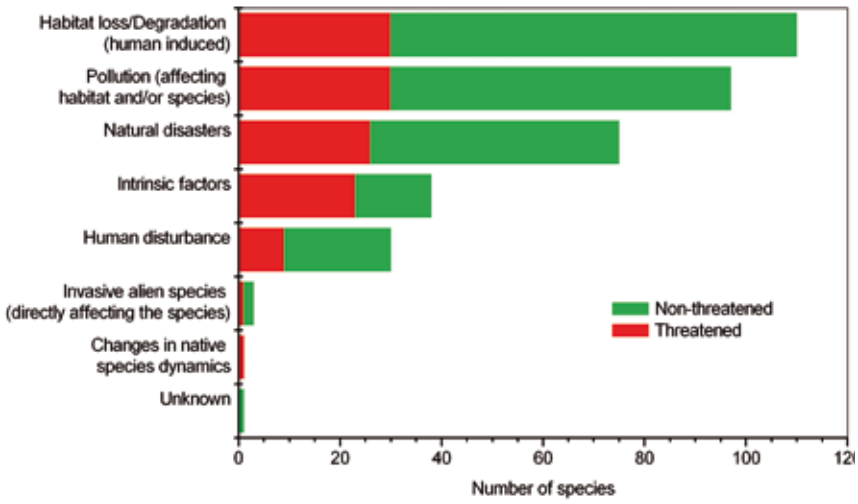


Figure 9. The present major threats to dragonflies in the Mediterranean Basin

Desiccation of aquatic habitats, as a result of climate change and over–irrigation, is likely to become the main threat for many threatened Mediterranean dragonflies. Stymfalia Lake, NE Peloponnese, Greece. Photo: © Jean–Pierre Boudot.

4. Recommendations for priority conservation measures

4.1 General

Species frequently require a combination of conservation responses to ensure their continued survival. These responses include legislation, research, monitoring, population management, and land acquisition or control. Although time-limited or local actions are important for the conservation of dragonflies, they are unlikely to be strong enough or coherent enough to prevent the extinction of those species who are already threatened across their whole range. Therefore, long-term coordinated actions are required at regional, national and international level.

The protection of sites plays a crucial role in any effective conservation strategy. Several international treaties call for the selection and protection of sites on the basis of their importance for biodiversity. In Europe, the primary mechanism for site protection is the Natura 2000 network of protected areas. The distribution data presented in Boudot *et al*. (2009) could be used to fine-tune the selection of dragonfly conservation areas. Many European countries have no formal schemes for monitoring common and widespread species, let alone those under threat. One of the future challenges is to improve the monitoring so as to increase the quantity and quality of the information available. The results presented here should be updated and improved in the future. National dragonfly population monitoring schemes have started in some EU member countries. For example in the Netherlands, the "De Vlinderstichting" (Dutch Butterfly Conservation) has set up a surveillance and monitoring network aimed at providing information on distribution and populations trends for all Dutch butterflies and dragonflies species.

4.2 Regional action

This report shows where the highest diversity, highest level of endemism and highest portion of threatened dragonflies are found within the Mediterranean region.

Aquatic habitats in the Maghreb are under a lot of pressure, resulting in the decline of species, such as the glittering demoiselle (*Calopteryx exul*). Local capacity building for using information on aquatic fauna in conservation planning is needed (Endangered). Photo: © Jean–Pierre Boudot.

Based on this, five areas with high conservation concern were selected. These areas are discussed below, and for each one the conservation actions are prioritized.

The Maghreb

The Maghreb has a high level of endemism and the pressure on freshwater habitats is increasing, largely given the population increase [x 2.5 in Morocco, x 3.1 in Algeria and x 2.3 in Tunisia between 1961 and 2003] (FAOSTAT, 2004 – 2005).

- A freshwater action plan for the Maghreb is highly desirable. This plan should include an overview of the protected areas which can be used to determine the main gaps in the protection of freshwater plants and animals.

- A species action plan for the CR and relict species, *Urothemis edwardsii*, is urgently needed. This could be carried out under a management plan for Lac Bleu (northeast Algeria); an area which has several relict macroinvertebrates.

- In Morocco and Tunisia, there is an advanced level of knowledge on dragonflies thanks to various important publications, but this should be urgently updated in Algeria as it could not be done during recent decades, except for in the northeast, due to the local politic situation. However, with the exception of Algeria, there is no specialist present in the Maghreb, so at present there is no monitoring being carried out in Morocco and Tunisia. It is advisable that a capacity building workshop be organized in order to train students and involve local people working within the network of Mediterranean dragonflies. This could also be used to increase contact between people working on freshwater issues in Tunisia, Algeria and Morocco.

The Levant

The Levant, including the southern part of Turkey, scores high in regards to levels of diversity, the presence of endemic species, and the presence of threatened species. The increasing demand for water, in combination with climate change, makes it likely that the conservation status of many species will deteriorate in the near future.

- A freshwater action plan for the region is needed. Protection of the largest river systems is dependent on the cooperation between the regional countries, and this is not easy given the local political situation. However, a freshwater action plan can be used to emphasize how important cooperation is and also outline possibilities. After a period of strong alteration in most local hydrosystems, some nature reserves have been created and may favour the monitoring of dragonflies if it is not already being done. The Lake Hula/Lake Agmon Nature Reserve in North Israel, and the Aammiq Wetland Nature Reserve in the Beqaa Valley in Lebanon, are fine examples of this. A freshwater action plan dealing with running waters would be an important complement to those addressing still waters, and it should include an assessment of the quality and conservation of the biodiversity in all kinds of freshwater habitats. Based on this analysis, catchments of major conservation concern for flora and fauna can then be determined.

- It is advisable that a species action plan for *Onychogomphus macrodon* be made. This species is strictly endemic to the Levant, where it is confined to large rivers. All these rivers are strongly impacted by gravel-mining, damming and pollution. In combination with other animals, this species could well be used as flagship for the protection of river systems in the Levant.

- The best knowledge regarding dragonflies refers mainly to the past. Presently, with the exception of Turkey, there are only a few permanent high-level specialists in this area, so the current information is only fragmentary. That said, real scientific studies by local people and scientific visitors are currently being done in some hotspots, such as the Aammiq Nature Reserve, where a number of short-term research projects and a monitoring programme have been or are being carried out. This reserve is managed by the Christian nature conservation organization "A Rocha Lebanon" and a paper report on dragonflies is available (Storey *et al.*, 2006). Nevertheless, the overall amount of distribution data and biological studies available for the Levant from the eighties and onwards remains rather low and incomplete. It is advisable that a capacity building workshop be organized in order to train students and involve the local people working in the network focusing on Mediterranean dragonflies.

Crete

The dragonfly fauna in Crete is relatively low but features two endemic species: *Coenagrion intermedium* and *Boyeria cretensis*. Both are threatened in the present context of global warming and rainfall deficit. They breed in shaded areas in the upper courses of some small Cretan rivers and are presently known from only 9 and 11 river systems, respectively. The protection of running waters and their forest environment is rather poor in Crete, and the rapid increase of spring capture throughout the whole of Greece to compensate the current rainfall deficit is an additional threat. The conservation of these two species implies the prohibition of any additional spring capture.

- Better knowledge on the distribution of *Boyeria cretensis* and *Coenagrion intermedium* is needed, and in having this, a better estimate of their long-term survival chances will be possible.

- A freshwater action plan is needed for Crete. This should include an assessment of the quality and conservation status of freshwater habitats (especially brooks), from which it will be decided whether the current situation is compatible with the conservation of freshwater biodiversity or if a restoration procedure should be initiated.

Southern Balkans

The southern Balkans have a rich dragonfly fauna including several endemic species. Nature organizations are not very strong in the area and there is little interest in nature compared to other parts of Europe. Many of the regional species live in brooks, and these habitats are strongly impacted by agricultural developments and pollution. In addition, climate change is severely impacting these habitats, resulting in the desiccation of many streams and rivers during the summer. Three of the most threatened dragonflies of the Mediterranean (*Pyrrhosoma elisabethae*, *Cordulegaster helladica* and *Somatochlora borisi*) are confined to brooks and small rivers from Greece and nearby countries (Albania, Bulgaria and European Turkey). Without action, these species might become extinct during the first half of this century.

It is advisable that a species action plan be made for these three taxa. The range of *Somatochlora borisi* is for a small part included in the WWF Dadia protected area in northeast Greece; this protected area should be extended across the range of this species to Greece, Bulgaria and north-European Turkey to create an international protected area, ensuring the conservation of the original deciduous forest and the traditional extensive rearing of goats and sheep. Most of the rivers inhabited by this species are already intermittent and almost dry in the summer, with only the deeper pools allowing the species to survive. For this reason, water capture and irrigation should be prohibited from late spring to the next rain season in autumn or early winter. In addition, total protection should be granted to the places where *Pyrrhosoma elisabethae* and *Cordulegaster helladica* are known to inhabit, conserving the current prevalent environmental conditions and prohibiting water capture in the upper courses of the brooks and rivers.

Western Mediterranean

With the exception of the species endemic to the Maghreb (see above), all endemic species of the Western Mediterranean have a relatively large range and none are in a threatened category. There are, however, great problems in freshwater management across the whole region. Over-irrigation is being increasingly observed due to the desiccation of rivers and brooks and furthermore, pollution is being poorly controlled, therefore dragonflies can be used to monitor freshwater hydrology and quality. In Portugal, Spain and Italy there is the potential to set up a network of volunteers to collect current distribution data on dragonflies, similar to the French INVOD and CILIF programmes, and from this, new information on the species listed in the Habitat Directive will be obtained. This will help to get an initial overview, which will be more deeply investigated by additional studies dealing with water chemistry and hydrology, and by establishing a biological index on representative hotspots.

- It is advisable that Portugal, Spain and Italy invest in a network of volunteers in order to collect more extensive distribution data. This should include the publication of updated identification tools in the local language and creating an internet facility for storing the records.

4.3 Dragonflies as tools: databases and monitoring

Dragonflies are excellent tools for freshwater conservation because:

- they are useful for providing a first insight into the quality and structure of aquatic habitats, although

they are not the best indicators and are not involved in determining biotic indexes.

- their distribution can be mapped with the aid of volunteers, so that much more information is available for this group than for any other.

- they are generally popular and have a wide audience, and thus can be used as appreciated ambassadors for freshwater conservation, which is important for raising awareness among non-specialists.

In order to use dragonflies as a quality indicator, up-to-date information on distribution is needed. For specific projects, specialists can gather information, however, to obtain countrywide information it is far more cost-efficient to establish a network of volunteers. This is what has been established in France since the 1980's, tends to develop in parts of Spain, and will probably be developed in Portugal and Italy. Building and constructing a network of volunteers is time consuming, and work on this needs financial support.

The distribution data on Mediterranean dragonflies is being maintained in several national and regional databases. All these databases have been built by single volunteers or by NGOs. Information on the contact persons of these databases can be obtained from the first author of the present report or found in Boudot *et al*. (2009). In most cases, the databases can be used for conservation projects and scientific research, but depending on the project, a financial contribution to the database management may or may not be required.

Dragonflies are suitable for monitoring the quality of freshwater habitats. Countrywide monitoring

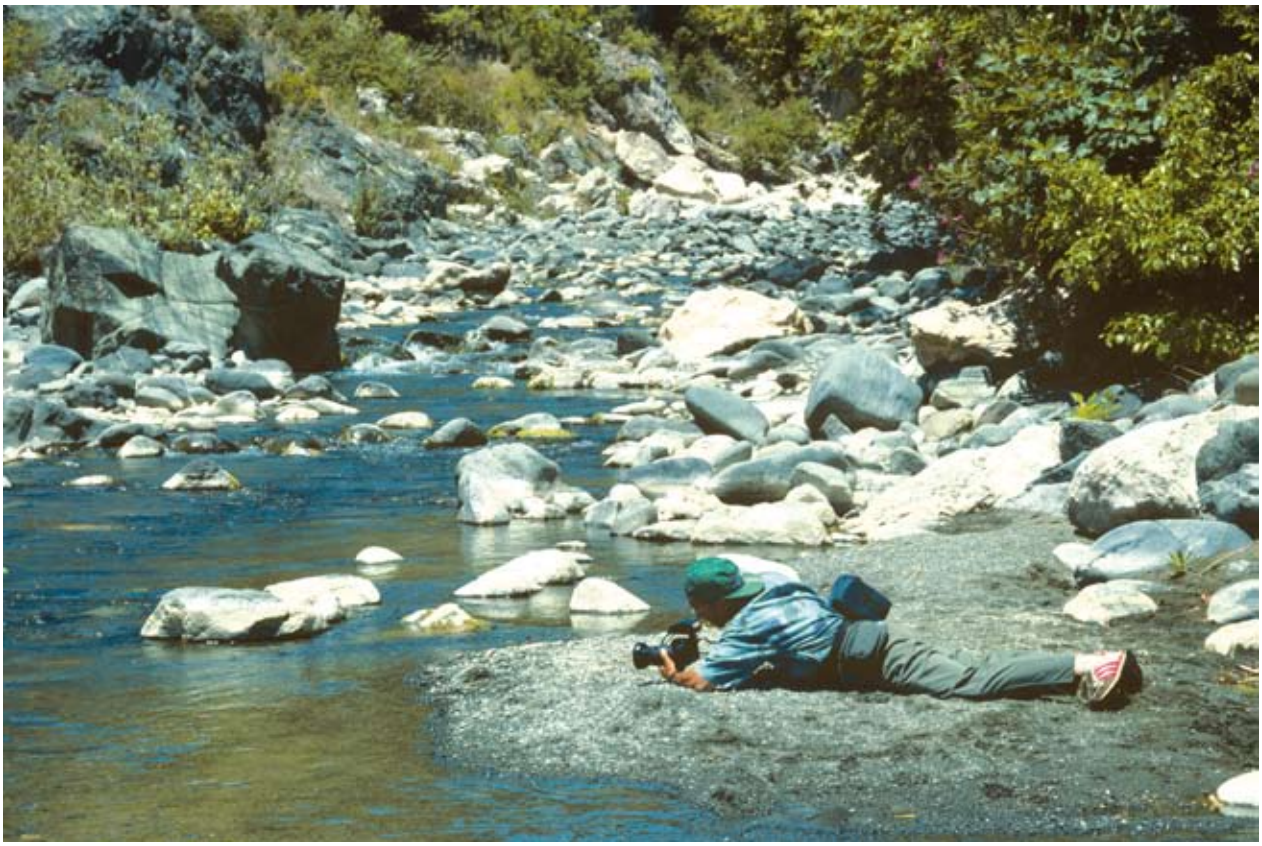
Dragonflies can serve as reliable indicators of water quality and habitat health. Piedmont, Italy. Photo: © Fabio Pupin.

based on work by volunteers is not yet possible in the Mediterranean, however small funded projects in order to monitor threatened endemic species are. This would be useful for species such as: *Calopteryx exul*, *Pyrrhosoma elisabethae*, *Onychogomphus macrodon* and *Somatochlora borisi*. Information on monitoring methods can be obtained from the Butterfly Conservation, The Netherlands.

5. Conclusion

The Mediterranean area is an hotspot of biodiversity and endemism for dragonflies too. For some of the countries included in the area some dragonfly species already receive some conservation attention thanks to international laws (e.g. the European Habitat Directive) but others do not and are facing the risk of extinction. The results of this Report highlight that Threatened dragonflies in the Mediterranean Basin require urgent action to improve their status and priorities identified in this study include addressing threats such as destruction and degradation of freshwater habitats and the need of improving monitoring, surveys and studies in some important areas in the Mediterranean Basin. In this report it is shown where the highest diversity, highest level of endemism and highest portion of threatened dragonflies is found within the Mediterranean region. Based on this, five areas, the Maghreb, The Levant, Crete island, Southern Balkans (mostly Greece) and Western Mediterranean, have been individuated where high conservation concern must be developed. To ensure that Mediterranean species are secure in the long term, this needs to be combined with the political will to truly integrate biodiversity conservation into all policy sectors. Sustained investment in species, site and landscape level conservation and monitoring is needed for all Mediterranean countries.

Dragonflies' species identification and data collection in the Teknepinar region, south of Turkey. Photo: ©Gilles Jacquemin.



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Appendix 1. Red List status of Mediterranean dragonflies

Order	Family	Species	IUCN Red List Category	IUCN Red List Criteria	Endemic to the Mediterranean? (Y/N)
ODONATA	AESHNIDAE	Aeshna mixta	LC		NO
ODONATA	AESHNIDAE	Anax ephippiger	LC		NO
ODONATA	LESTIDAE	Lestes numidicus	DD		YES
ODONATA	LIBELLULIDAE	Acisoma panorpoides	EN	A2c; B2ab(iii)	NO
ODONATA	LIBELLULIDAE	Pantala flavescens	NA		NO
ODONATA	LIBELLULIDAE	Rhyothemis semihyalina	RE		NO
ODONATA	LIBELLULIDAE	Sympetrum sanguineum	LC		NO
ODONATA	CALOPTERYGIDAE	Calopteryx haemorrhoidalis	LC		NO
ODONATA	COENAGRIONIDAE	Coenagrion puella	LC		NO
ODONATA	COENAGRIONIDAE	Enallagma deserti	LC		YES
ODONATA	COENAGRIONIDAE	Erythromma lindenii	LC		NO
ODONATA	PLATYCNEMIDIDAE	Platycnemis subdilatata	LC		YES
ODONATA	AESHNIDAE	Aeshna caerulea	VU	B2ab(iii)	NO
ODONATA	AESHNIDAE	Aeshna grandis	LC		NO
ODONATA	AESHNIDAE	Aeshna juncea	LC		NO
ODONATA	AESHNIDAE	Aeshna subarctica	NT		NO
ODONATA	AESHNIDAE	Boyeria cretensis	VU	B1ab(ii,iii,iv)+ 2ab(ii,iii,iv)	YES
ODONATA	COENAGRIONIDAE	Coenagrion hastulatum	LC		NO
ODONATA	COENAGRIONIDAE	Coenagrion intermedium	NT		YES
ODONATA	COENAGRIONIDAE	Nehalennia speciosa	CR	A1c; B1b(i,ii,iii,iv, v)+2ab(i,ii,iii,iv)	NO
ODONATA	CORDULEGASTERIDAE	Cordulegaster trinacriae	NT		YES
ODONATA	CORDULIIDAE	Epitheca bimaculata	DD		NO
ODONATA	CORDULIIDAE	Somatochlora alpestris	NT		NO
ODONATA	CORDULIIDAE	Somatochlora arctica	NT		NO
ODONATA	CORDULIIDAE	Somatochlora flavomaculata	LC		NO
ODONATA	GOMPHIDAE	Ophiogomphus cecilia	LC		NO
ODONATA	LESTIDAE	Lestes macrostigma	NT		NO
ODONATA	LESTIDAE	Lestes sponsa	LC		NO
ODONATA	LESTIDAE	Sympecma paedisca	EN	B1ab(i,ii,iii,iv,v)+2 ab(i,ii,iii,iv,v)	NO
ODONATA	LIBELLULIDAE	Leucorrhinia caudalis	NT		NO
ODONATA	LIBELLULIDAE	Leucorrhinia pectoralis	LC		NO
ODONATA	LIBELLULIDAE	Sympetrum danae	LC		NO
ODONATA	COENAGRIONIDAE	Ischnura genei	LC		YES
ODONATA	LIBELLULIDAE	Leucorrhinia albifrons	EN	B2ab(i,ii,iii,iv,v); C1	NO
ODONATA	GOMPHIDAE	Onychogomphus assimilis	EN	A2ac+3bc	NO
ODONATA	CORDULEGASTRIDAE	Cordulegaster bidentata	NT	B2b(i,ii,iii,iv,v)	NO
ODONATA	CORDULIIDAE	Somatochlora borisi	VU	C1	YES

Order	Family	Species	IUCN Red List Category	IUCN Red List Criteria	Endemic to the Mediterranean? (Y/N)
ODONATA	LIBELLULIDAE	Orthetrum brunneum	LC		NO
ODONATA	COENAGRIONIDAE	Ischnura fountaineae	LC		NO
ODONATA	GOMPHIDAE	Onychogomphus forcipatus	LC		NO
ODONATA	GOMPHIDAE	Onychogomphus uncatus	LC		NO
ODONATA	GOMPHIDAE	Paragomphus genei	LC		NO
ODONATA	LESTIDAE	Lestes virens	LC		NO
ODONATA	LESTIDAE	Sympecma fusca	LC		NO
ODONATA	LIBELLULIDAE	Diplacodes lefebvrii	LC		NO
ODONATA	LIBELLULIDAE	Orthetrum cancellatum	LC		NO
ODONATA	LIBELLULIDAE	Orthetrum chrysostigma	LC		NO
ODONATA	LIBELLULIDAE	Orthetrum coerulescens	LC		NO
ODONATA	LIBELLULIDAE	Orthetrum sabina	LC		NO
ODONATA	LIBELLULIDAE	Orthetrum trinacria	LC		NO
ODONATA	LIBELLULIDAE	Sympetrum meridionale	LC		NO
ODONATA	LIBELLULIDAE	Sympetrum sinaiticum	LC		NO
ODONATA	LIBELLULIDAE	Trithemis arteriosa	LC		NO
ODONATA	LIBELLULIDAE	Trithemis kirbyi	LC		NO
ODONATA	COENAGRIONIDAE	Coenagrion caerulescens	LC		YES
ODONATA	COENAGRIONIDAE	Agriocnemis exilis	RE		NO
ODONATA	CALOPTERYGIDAE	Calopteryx exul	EN	B2ab(ii,iii,iv,v)	YES
ODONATA	LIBELLULIDAE	Nesciothemis farinosa	EN	B2ab(i,ii,iii,iv)	NO
ODONATA	LIBELLULIDAE	Brachythemis fuscopalliata	VU	A2ac+3c; C1	NO
ODONATA	COENAGRIONIDAE	Ceriagrion glabrum	RE		NO
ODONATA	GOMPHIDAE	Gomphus graslinii	EN	B2ab(iii)	NO
ODONATA	GOMPHIDAE	Onychogomphus costae	NT		YES
ODONATA	CORDULIIDAE	Oxygastra curtisii	LC		NO
ODONATA	CORDULEGASTRIDAE	Cordulegaster helladica	EN	A2ac+3c; B2ab(i,ii,iii,iv,v)	YES
ODONATA	AESHNIDAE	Boyeria irene	LC		NO
ODONATA	GOMPHIDAE	Gomphus lucasii	VU	A3c; C1	YES
ODONATA	COENAGRIONIDAE	Coenagrion mercuriale	NT		NO
ODONATA	LIBELLULIDAE	Selysiothemis nigra	LC		NO
ODONATA	COENAGRIONIDAE	Pseudagrion niloticum	EN	B2ab(i,ii,iii,iv,v)	NO
ODONATA	COENAGRIONIDAE	Pseudagrion nubicum	EN	B2ab(i,ii,iii,iv)	NO
ODONATA	COENAGRIONIDAE	Pyrrhosoma nymphula	LC		NO
ODONATA	MACROMIIDAE	Phyllomacromia picta	RE		NO
ODONATA	CORDULEGASTRIDAE	Cordulegaster princeps	NT		YES
ODONATA	LIBELLULIDAE	Libellula quadrimaculata	LC		NO
ODONATA	PLATYCNEMIDIDAE	Mesocnemis robusta	CR	B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v)	NO
ODONATA	COENAGRIONIDAE	Agriocnemis sania	CR	A2ce+3ce; B2ab(i,ii,iii,iv,v); D1	NO
ODONATA	COENAGRIONIDAE	Coenagrion scitulum	LC		NO
ODONATA	GOMPHIDAE	Gomphus simillimus	NT		NO
ODONATA	MACROMIIDAE	Macromia splendens	VU	A3c	NO
ODONATA	COENAGRIONIDAE	Pseudagrion sublacteum	LC		NO

Order	Family	Species	IUCN Red List Category	IUCN Red List Criteria	Endemic to the Mediterranean? (Y/N)
ODONATA	GOMPHIDAE	Lindenia tetraphylla	NT		NO
ODONATA	CALOPTERYGIDAE	Calopteryx virgo	LC		NO
ODONATA	GOMPHIDAE	Gomphus flavipes	NT		NO
ODONATA	LIBELLULIDAE	Leucorrhinia dubia	NT	A3c	NO
ODONATA	AESHNIDAE	Brachytron pratense	NT		NO
ODONATA	AESHNIDAE	Caliaeschna microstigma	NT		NO
ODONATA	CALOPTERYGIDAE	Calopteryx splendens	LC		NO
ODONATA	COENAGRIONIDAE	Ceriagrion georgifreyi	VU	A3c	YES
ODONATA	COENAGRIONIDAE	Coenagrion ornatum	NT		NO
ODONATA	COENAGRIONIDAE	Coenagrion pulchellum	NT		NO
ODONATA	COENAGRIONIDAE	Erythromma najas	NT		NO
ODONATA	COENAGRIONIDAE	Ischnura elegans	LC		NO
ODONATA	COENAGRIONIDAE	Pyrrhosoma elisabethae	EN	B2ab(ii,iii)	YES
ODONATA	CORDULEGASTRIDAE	Cordulegaster heros	VU	A3c	NO
ODONATA	CORDULEGASTRIDAE	Cordulegaster insignis	NT		NO
ODONATA	CORDULEGASTRIDAE	Cordulegaster picta	VU	A3c	NO
ODONATA	CORDULIIDAE	Cordulia aenea	NT		NO
ODONATA	CORDULIIDAE	Somatochlora meridionalis	LC		NO
ODONATA	CORDULIIDAE	Somatochlora metallica	NT		NO
ODONATA	EUPHEIDAE	Epallage fatime	LC		NO
ODONATA	GOMPHIDAE	Gomphus schneiderii	LC		NO
ODONATA	LESTIDAE	Lestes parvidens	LC		NO
ODONATA	LIBELLULIDAE	Libellula depressa	LC		NO
ODONATA	LIBELLULIDAE	Libellula fulva	LC		NO
ODONATA	LIBELLULIDAE	Orthetrum albistylum	LC		NO
ODONATA	LIBELLULIDAE	Sympetrum depressiusculum	VU	A3c	NO
ODONATA	LIBELLULIDAE	Sympetrum flaveolum	LC		NO
ODONATA	LIBELLULIDAE	Sympetrum pedemontanum	LC		NO
ODONATA	PLATYCNEMIDIDAE	Platycnemis pennipes	LC		NO
ODONATA	PLATYCNEMIDIDAE	Platycnemis pennipes	LC		YES
ODONATA	GOMPHIDAE	Gomphus vulgatissimus	LC		NO
ODONATA	AESHNIDAE	Aeshna cyanea	LC		NO
ODONATA	CALOPTERYGIDAE	Calopteryx xanthostoma	LC		NO
ODONATA	COENAGRIONIDAE	Erythromma viridulum	LC		NO
ODONATA	COENAGRIONIDAE	Ischnura graellsii	LC		NO
ODONATA	PLATYCNEMIDIDAE	Platycnemis latipes	LC		NO
ODONATA	LESTIDAE	Lestes viridis	LC		NO
ODONATA	LIBELLULIDAE	Orthetrum nitidinerve	LC		NO
ODONATA	LIBELLULIDAE	Sympetrum fonscolombii	LC		NO
ODONATA	LIBELLULIDAE	Sympetrum vulgatum	NT		NO
ODONATA	CORDULEGASTRIDAE	Cordulegaster boltonii	LC		NO
ODONATA	AESHNIDAE	Anax parthenope	LC		NO
ODONATA	AESHNIDAE	Aeshna isoceles	LC		NO
ODONATA	AESHNIDAE	Anax imperator	LC		NO
ODONATA	COENAGRIONIDAE	Ceriagrion tenellum	LC		NO
ODONATA	COENAGRIONIDAE	Enallagma cyathigerum	LC		NO
ODONATA	COENAGRIONIDAE	Ischnura pumilio	LC		NO

Order	Family	Species	IUCN Red List Category	IUCN Red List Criteria	Endemic to the Mediterranean? (Y/N)
ODONATA	AESHNIDAE	Aeshna affinis	LC		NO
ODONATA	GOMPHIDAE	Gomphus pulchellus	LC		NO
ODONATA	LESTIDAE	Lestes barbarus	LC		NO
ODONATA	LESTIDAE	Lestes dryas	LC		NO
ODONATA	LIBELLULIDAE	Crocothemis erythraea	LC		NO
ODONATA	LIBELLULIDAE	Sympetrum striolatum	LC		NO
ODONATA	LIBELLULIDAE	Trithemis annulata	LC		NO
ODONATA	LIBELLULIDAE	Zygonyx torridus	NT		NO
ODONATA	PLATYCNEMIDIDAE	Platycnemis acutipennis	LC		NO
ODONATA	GOMPHIDAE	Gomphus ubadschii	VU	A2c+3c+4c	NO
ODONATA	GOMPHIDAE	Onychogomphus flexuosus	VU	A2c+3c+4c	NO
ODONATA	GOMPHIDAE	Paragomphus lineatus	DD		NO
ODONATA	LIBELLULIDAE	Crocothemis servilia	LC		NO
ODONATA	LIBELLULIDAE	Libellula pontica	NT		NO
ODONATA	LIBELLULIDAE	Sympetrum decoloratum	DD		NO
ODONATA	LIBELLULIDAE	Sympetrum haritonovi	CR	B1ab(iii)+2ab(iii)	NO
ODONATA	LIBELLULIDAE	Trithemis festiva	LC		NO
ODONATA	CALOPTERYGIDAE	Calopteryx syriaca	EN	A2ac	YES
ODONATA	PLATYCNEMIDIDAE	Platycnemis dealbata	LC		NO
ODONATA	COENAGRIONIDAE	Coenagrion syriacum	NT		YES
ODONATA	CALOPTERYGIDAE	Calopteryx hyalina	EN	A2ac	YES
ODONATA	AESHNIDAE	Anax immaculifrons	LC		NO
ODONATA	PLATYCNEMIDIDAE	Platycnemis kervillei	LC		YES
ODONATA	COENAGRIONIDAE	Ischnura intermedia	DD		NO
ODONATA	COENAGRIONIDAE	Ischnura evansi	LC		NO
ODONATA	COENAGRIONIDAE	Ischnura senegalensis	LC		NO
ODONATA	COENAGRIONIDAE	Pseudagrion syriacum	LC		YES
ODONATA	COENAGRIONIDAE	Pseudagrion torridum	LC		NO
ODONATA	LIBELLULIDAE	Brachythemis leucosticta	LC		NO
ODONATA	GOMPHIDAE	Onychogomphus macrodon	VU	A3c+4c	NO
ODONATA	GOMPHIDAE	Gomphus davidi	LC		YES
ODONATA	LIBELLULIDAE	Orthetrum abbotti	DD		NO
ODONATA	LIBELLULIDAE	Orthetrum ransonnetii	LC		NO
ODONATA	LIBELLULIDAE	Orthetrum taeniolatum	LC		NO
ODONATA	LIBELLULIDAE	Crocothemis sanguinolenta	LC		NO
ODONATA	GOMPHIDAE	Onychogomphus lefebvrii	LC		NO
ODONATA	GOMPHIDAE	Paragomphus pumilio	LC		NO
ODONATA	LIBELLULIDAE	Urothemis edwardsii	CR	A2ac; B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v); C1+2a(ii); D	NO
ODONATA	COENAGRIONIDAE	Ischnura saharensis	LC		YES

Appendix 2. Example of species summary and distribution map

Urothemis edwardsii

CR

Taxonomic Authority: (Selys, 1849)

☐ Global Assessment ☑ Regional Assessment Region: Mediterranean ☐ Endemic to region

Synonyms

Libellula edwardsii Selys, 1849
Urothemis edwardsi Dumont, 1975

Common names

BLUE BASKER **English (Primary)**

Upper Level Taxonomy

Kingdom: ANIMALIA Phylum: ARTHROPODA
Class: INSECTA Order: ODONATA
Family: LIBELLULIDAE

Lower Level Taxonomy

Rank: Infra- rank name: ☐ Plant Hybrid
Subpopulation: Authority:

The taxonomy of Urothemis edwardsii (Selys, 1849) poses no problems, with the exception of the subspecies hulae Dumont, 1975, describing relict populations in the upper Jordan Valley (Dumont 1975, 1991). Because the species was described from a single female (type locality: Lac Oubeira, N-Algeria) no variation for nominotypical population(s) were known. Its range has since been shown to lie predominantly south of the Sahara, encompassing most of tropical Africa. To judge the validity of U. edwardsii hulae it is therefore crucial to know the variation in nominotypical population(s) from Algeria. Although Algerian specimens are said to be come closer to sub-Saharan ones, U. e. hulae specimens are described to fall within the variation (extend of basal spot in hindwing) of the latter. We therefore conclude that subspecies hulae is not valid.

General Information

Distribution

The main range of Urothemis edwardsii lies south of the Sahara, encompassing most of tropical Africa (Dijkstra 2006, Samraoui et al. 1993). Regional records for the Mediterranean are restricted to three localities in northern Algeria (Samraoui et al. 1993), one sighting in Tunisia (Jödicke et al. 2000) and about eight localities in the Jordan Valley (Dumont 1975, 1991, Schmidt 1938, Schneider 1986). Apart from the now extinct populations in Palestine, there are strong relict subpopulations in southeastern Arabia, Oman (Waterston 1981, Waterston and Pittaway 1991, Schneider and Dumont 1997). Of the three Algerian populations two became extinct within the last two decades; the last one, Lac Bleu (a lake of only 2 ha size) had not more than forty (40) individuals restricted to a small sector of the lake.

Type locality Algeria.

Range Size

Area of Occupancy:
Extent of Occurrence: 20 km² (2

Map Status: incomplete

Elevation

Upper limit:
Lower limit:

Depth

Upper limit:
Lower limit:

Depth Zones

☐ Shallow photic ☐ Bathyl ☐ Hadal
☐ Photic ☐ Abyssal

Biogeographic Realm

☑ Afrotropical
☐ Antarctic
☐ Australasian
☐ Neotropical
☐ Oceanian
☐ Palearctic
☐ Indomalayan
☐ Nearctic

Population

In 1992 not more than forty (40) individuals were counted from the last known regional population at Lac Bleu in northern Algeria (Samraoui et al. 1993, Samraoui and Menai 1999, Samraoui and Corbet 2000). It is extinct in Israel.

Total Population Size

Minimum Population Size: Maximum Population Size:

Habitat and Ecology

Marshy verges of lakes and nearly stagnant sections of rivers and wadis.

System		Movement pattern		Crop Wild Relative
☑ Terrestrial	☑ Freshwater	☐ Nomadic	☐ Congregatory/Dispersive	☐ Is the species a wild relative of a crop?
	☐ Marine	☐ Migratory	☐ Altitudinally migrant	

Threats

Eutrophication, destruction of riparian vegetation, and water extraction. Fire is also a threat.

	Past	Present	Future
1 Habitat Loss/Degradation (human induced)	☑	☑	☑
1.1 Agriculture	☑	☑	☑
1.1.7 Freshwater aquaculture	☑	☑	☑
1.3 Extraction	☑	☑	☑
1.3.6 Groundwater extraction	☑	☑	☑
1.5 Invasive alien species (directly impacting habitat)	☑	☑	☑
6 Pollution (affecting habitat and/or species)	☑	☑	☑
6.3 Water pollution	☑	☑	☑
6.3.1 Agriculture	☑	☑	☑
9 Intrinsic factors	☑	☑	☑
9.1 Limited dispersal	☑	☑	☑
9.2 Poor recruitment/reproduction/regeneration	☑	☑	☑
9.5 Low densities	☑	☑	☑
9.9 Restricted range	☑	☑	☑
10 Human disturbance	☑	☑	☑
10.5 Fire	☑	☑	☑

Conservation Measures

Unless urgent, immediate and effective measures are taken to protect Lac Bleu from human impact (pollution, drainage), the last known (topotypical) population of Urothemis edwardsii will probably cease to exist (Samraoui and Corbet 2000).

	In Place	Needed
1 Policy-based actions	☐	☑
1.1 Management plans	☐	☑
1.2 Legislation	☐	☑
1.3 Community management	☐	☑
2 Communication and Education	☐	☑
3 Research actions	☑	☑
3.1 Taxonomy	☑	☐
3.2 Population numbers and range	☑	☐
3.3 Biology and Ecology	☐	☑
3.4 Habitat status	☑	☐
3.5 Threats	☑	☐
3.8 Conservation measures	☐	☑
3.9 Trends/Monitoring	☐	☑
4 Habitat and site-based actions	☐	☑
4.1 Maintenance/Conservation	☐	☑
4.2 Restoration	☐	☑
4.3 Corridors	☐	☑
4.4 Protected areas	☐	☑
4.4.1 Identification of new protected areas	☐	☑

4.2 Restoration	☐	☑
4.3 Corridors	☐	☑
4.4 Protected areas	☐	☑
4.4.1 Identification of new protected areas	☐	☑
4.4.4 Expansion	☐	☑
4.5 Community-based initiatives	☐	☑

Countries of Occurrence

	PRESENCE							ORIGIN				
	Year Round	Breeding Season only	Non-breeding season only	Passage migrant	Possibly extinct	Extinct	Presence uncertain	Native	Introduced	Re-Introduced	Vagrant	Origin uncertain
Algeria	☑	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐
Israel	☐	☐	☐	☐	☐	☑	☐	☑	☐	☐	☐	☐
Palestinian Territory, Occupied	☐	☐	☐	☐	☐	☑	☐	☑	☐	☐	☐	☐
Tunisia	☐	☐	☐	☐	☐	☑	☐	☑	☐	☐	☐	☐

General Habitats	Score	Description	Major Importance
5 Wetlands (inland)	1	Suitable	Unset
5.4 Wetlands (inland) - Bogs, Marshes, Swamps, Fens, Peatlands	1	Suitable	Unset
5.5 Wetlands (inland) - Permanent Freshwater Lakes (over 8ha)	1	Suitable	Unset
5.7 Wetlands (inland) - Permanent Freshwater Marshes/Pools (under 8ha)	1	Suitable	Unset
5.9 Wetlands (inland) - Freshwater Springs and Oases	1	Suitable	Unset

Ecosystem Services

☐ Insufficient Information available ☐ Species provides no ecosystem services

Score according to relative importance where 1 = very important, 2 = important, 3 = some importance, 4 = not important/relevant and 5 = not known.

Ecosystem service	Score (from 1 to 5)	Geographic range over which benefits are felt?
Water Quality	4	Unknown
Water Supplies	4	Unknown
Flood Control	4	Unknown
Climate Regulation	4	Unknown
Landscape	4	Unknown
Air Quality	4	Unknown
Nutrient Cycling	4	Unknown
Habitat Maintenance	4	Unknown
Provision of Critical Habitat	4	Unknown
Pollination	4	Unknown
Erosion Control	4	Unknown
Biocontrol	4	Unknown
Shoreline Protection	4	Unknown
Other (specify)		
Define Other:		
Other (specify)		
Define Other:		

Species Utilisation

☑ Species is not utilised at all

IUCN Red Listing

Red List Assessment: (using 2001 IUCN system) Critically Endangered (CR)

Threat category adjusted from Global to Regional status: No Change in Category

Red List Criteria: A2ac; B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v); C1+2a(ii); D

Date Last Seen (only for EX, EW or Possibly EX species):

Is the species Possibly Extinct? ☑ Possibly Extinct Candidate? ☐

Rationale for the Red List Assessment

The two regional populations in the Mediterranean (Levant, and northeastern Algeria) of Urothemis edwardsii have lost at least 80% of their subpopulations within the last 10/20 years: eight localities in Israel/Palestine are all now extinct; and only one of the three known locations in northeastern Algeria is left (at Lac Bleu). This evidence is based on direct observations carried out regularly (Samraoui et al. 1993; Samraoui and Menai 1999; Samraoui and Corbet 2000; Dumont 1975, 1991; Dimentman et al. 1992). One observation (without voucher specimen) in Tunisia (Jödicke et al. 2000) needs confirmation, however habitat in this part of the range is now destroyed so it is likely now extinct in Tunisia.

As Lac Bleu covers only about 20 km², the extent of occurrence (EOO) is less than 100 km². The breeding population of not more than 40 breeding individuals is said to be restricted to one small sector of the lake (area of occupancy (AOO) <10 km²) and there is a continuing decline in habitat quality (Samraoui et al. 1993, Samraoui and Corbet 2000). When there are only about 40 adults on the wing, then it is more than reasonable to assume that the total population size (including larvae) at this single location is less than 250.

The Lac Bleu site was visited in 2007 and no individuals were found (it was last recorded in 2006). It may already be Regionally Extinct in the Mediterranean region, but more surveys are required to confirm this, therefore it is currently assessed as Critically Endangered (Possibly Extinct) within the Mediterranean. A future reassessment may result in this species moving into the Regionally Extinct category for the Mediterranean and North Africa regions. It should also be noted that the Algerian population is the only nominotypical one left.

There is no immigration/recruitment of Urothemis edwardsii individuals from outside the region (from sub-Saharan populations) therefore the initial category is retained.

Reason(s) for Change in Red List Category from the Previous Assessment:

- ☐ Genuine Change
  - ☐ Genuine (recent)
  - ☐ Genuine (since first assessment)
- ☐ Nongenuine Change
  - ☐ New information
  - ☐ Knowledge of Criteria
  - ☐ Incorrect data used previously
  - ☐ Taxonomy
  - ☐ Criteria Revisio
  - ☐ Other
- ☐ No Change
  - ☐ Same category and criteria
  - ☐ Same category but change in criteria

Current Population Trend: Decreasing

Date of Assessment: 10/4/2007

Name(s) of the Assessor(s): Samraoui, B. & Schneider, W

Evaluator(s): Boudot, J.-P. (Freshwater Biodiversity Assessment Workshop, Oct. 2007) & Pollock, C.M. (Red List Unit)

Notes:

207 IUCN Red List: LC (Clausnitzer, V. 2006)

% population decline in the past: 80

Time period over which the past decline has been measured for applying Criterion A or C1 (in years or generations): 10 to 15 years

% population decline in the future: ?

Time period over which the future decline has been measured for applying Criterion A or C1 (in years or generations):

Number of Locations: 1

Severely Fragmented:

Number of Mature Individuals: 40

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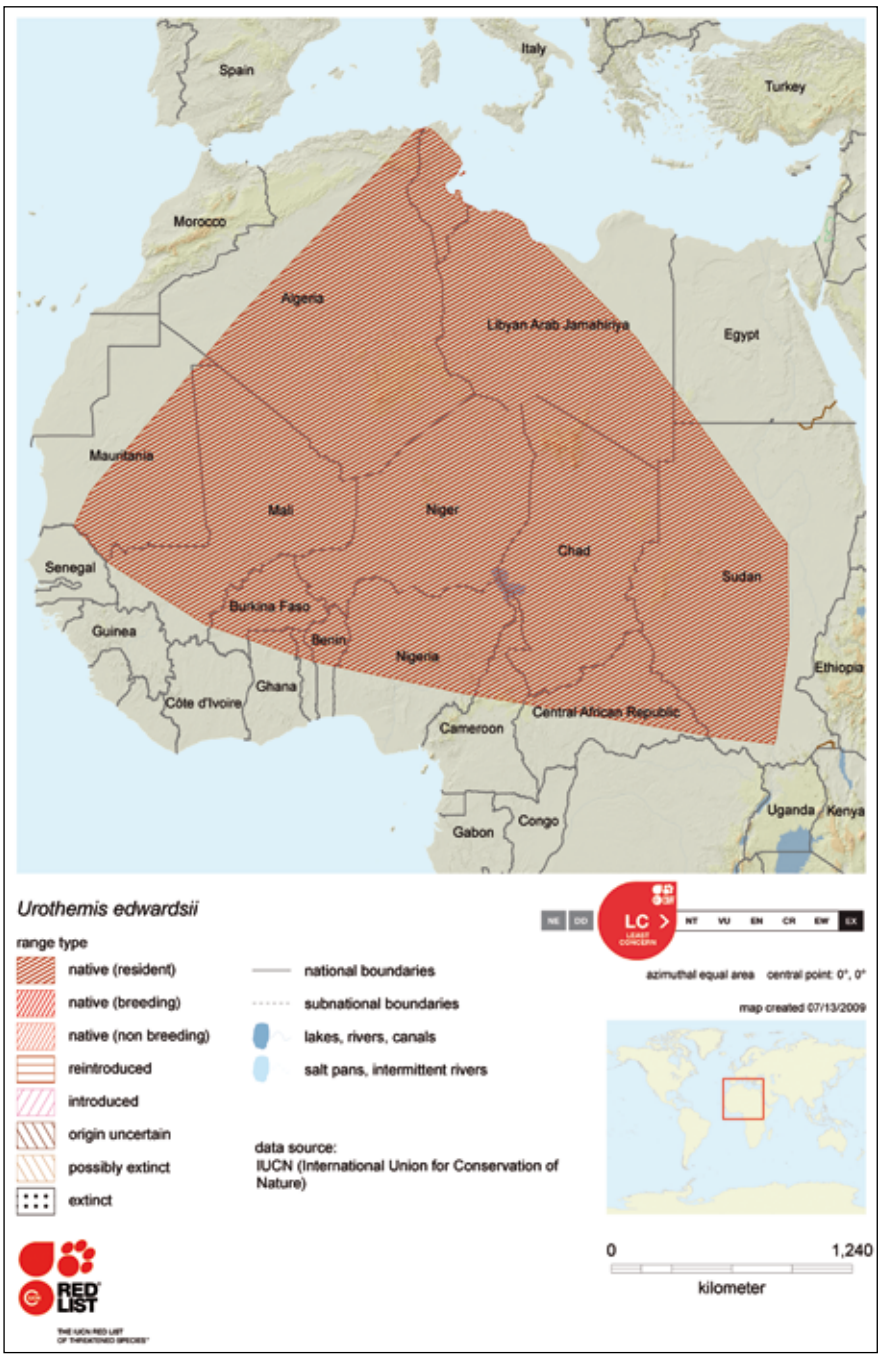

Appendix 3. Summary of the IUCN's Red List Categories and Criteria Version 3.1

Summary of the five criteria (A–E) used to evaluate if a taxon belongs in a threatened category (Critically Endangered, Endangered or Vulnerable).

Summary of the five criteria (A–E) used to evaluate if a taxon belongs in a threatened category (Critically Endangered, Endangered or Vulnerable).

Use any of the criteria A–E	**Critically Endangered**	**Endangered**	**Vulnerable**
A. Population reduction	Declines measured over the longer of 10 years or 3 generations		
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%
A1. Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible **AND** understood **AND** have ceased, based on and specifying any of the following: **(a)** direct observation **(b)** an index of abundance appropriate to the taxon **(c)** a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality **(d)** actual or potential levels of exploitation **(e)** effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.			
A2. Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (e) under A1.			
A3. Population reduction projected or suspected to be met in the future (up to a maximum of 100 years) based on (b) to (e) under A1.			
A4. An observed, estimated, inferred, projected or suspected population reduction (up to a maximum of 100 years) where the time period must include both the past and the future, and where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (e) under A1.			
B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)			
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
AND at least 2 of the following:			
(a) Severely fragmented, **OR** Number of locations	= 1	≥ 5	≥ 10
(b) Continuing decline in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** area, extent and/or quality of habitat; **(iv)** number of locations or subpopulations; **(v)** number of mature individuals.			
(c) Extreme fluctuations in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** number of locations or subpopulations; **(iv)** number of mature individuals.			
C. Small population size and decline			
Number of mature individuals	< 250	< 2,500	< 10,000
AND either C1 or C2:			
C1. An estimated continuing decline of at least: (up to a max. of 100 years in future)	25% in 3 years or 1 generation	20% in 5 years or 2 generations	10% in 10 years or 3 generations
C2. A continuing decline **AND** (a) and/or (b):			
(a i) Number of mature individuals in each subpopulation:	< 50	< 250	< 1,000
or			
(a ii) % individuals in one subpopulation =	90–100%	95–100%	100%
(b) Extreme fluctuations in the number of mature individuals.			
D. Very small or restricted population			
Either:			
Number of mature individuals	< 50	< 250	**D1.** < 1,000
			AND/OR
	Restricted area of occupancy		**D2.** typically: AOO < 20 km² or number of locations ≥ 5
E. Quantitative Analysis			
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations (100 years max.)	≥ 20% in 20 years or 5 generations (100 years max.)	≥ 10% in 100 years

IUCN – The Species Survival Commission

The Species Suvrvival Commission (SSC) is the largest of IUCN's six volunteer commissions with a global membership of 8,000 experts. SSC advises IUCN and its members on the wide range of technical and scientific aspects of species conservation and is dedicated to securing a future for biodiversity. SSC has significant input into the international agreements dealing with biodiversity conservation.
www.iucn.org/ssc

IUCN – Species Programme

The IUCN Species Programme supports the activities of the IUCN Species Survival Commission and individual Specialist Groups, as well as implementing global species conservation initiatives. It is an integral part of the IUCN Secretariat and is managed from IUCN's international headquarters in Gland, Switzerland. The species Programme includes a number of technical units covering Species Trade and Use, The IUCN Red List, Freshwater Biodiversity Assessment Initiative (all located in Cambridge, UK), and the Global Biodiversity Assessment Initiative (located n Washington DC, USA).
www.iucn.org/species

IUCN - Dragonfly Specialist Group

The IUCN Dragonfly Specialist Group focuses on the conservation of damselflies, dragonflies and their freshwater habitats. The DSG has a global volunteer network of over 50 expert members across the globe. Main focus of the work is the gathering and dissemination of information on distribution and threats of the nearly 6.000 damselflies and dragonflies. Currently the DSG is working on distribution databases and an assessment of the threat status of all damselflies and dragonflies. The Global Dragonfly Assessment will be an important tool in the conservation of freshwater habitats.

IUCN – Centre for Mediterranean Cooperation

The Centre was opened in October 2001 and is located in the offices of the Parque Tecnologico de Andalucia, in Malaga. IUCN has over 179 members in the Mediterranean region, including 15 governments. Its mission is to influence, encourage and assist Mediterranean societies to conserve and use sustainably the natural resources of the region.
www.iucn.org/mediterranean

IUCN Red List of Threatened Species™ – Regional Assessments

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THE IUCN RED LIST
OF THREATENED SPECIES ™

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Core support to the IUCN Centre for Mediterranean Cooperation is provided by:

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